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ABSTRACT

This seventh grade mathematics guide is one of a series of guides, K-12, that were developed by teachers to help introduce environmental education into the total curriculum. The guides are supplementary in design, containing a series of episodes (minilessons) that reinforce the relationships between ecology and mathematics. It is the teacher's decision when the episodes may best be integrated into the existing classroom curriculum. The episodes are built around 12 major environmental concepts that form a framework for each grade or subject area, as well as for the entire K-12 program. Although the same concepts are used throughout the K-12 program, emphasis is placed on different aspects of each concept at different grade levels or subject levels. This guide focuses on aspects such as proportion, computation, and percent. The 12 concepts are covered in one of the episodes contained in the guide. Further, each episode offers subject area integration, subject area activities, interdisciplinary activities, cognitive and affective behavioral objectives, and suggested references and resource materials useful to teachers and students. (Author/TK)

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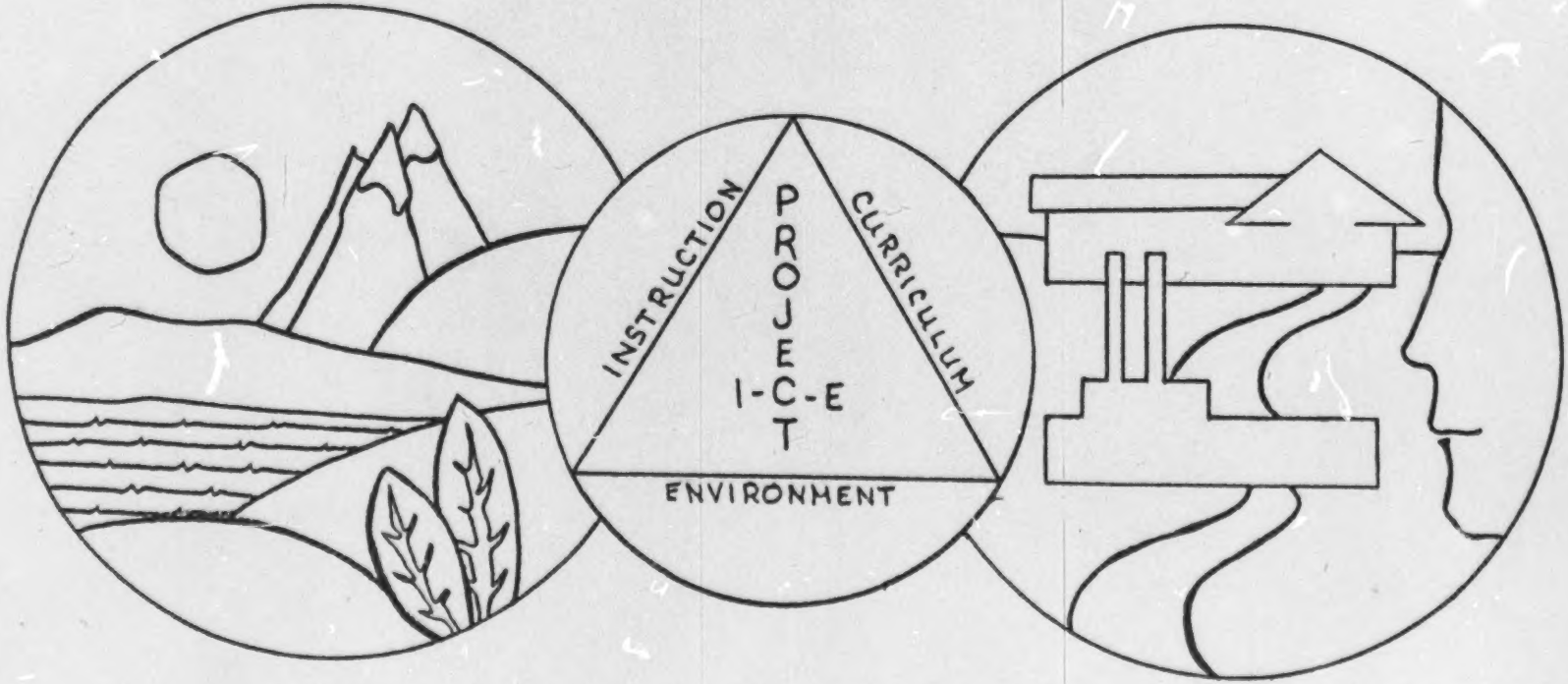
ENVIRONMENTAL EDUCATION GUIDE



MATHEMATICS 7

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FORWARD TO PROJECT I-C-E ENVIRONMENTAL EDUCATION GUIDES

In 1969, the First Environmental Quality Education Act was proposed in the United States Congress. At the time of the introduction of that legislation, I stated:

"There is a dire need to improve the understanding by Americans of the ominous deterioration of the Nation's environment and the increasing threat of irreversible ecological catastrophe. We must all become stewards for the preservation of life on our resource-deficient planet."

In the three years since the Environmental Education Act was passed by the Congress, much has happened in the United States to reinforce the great need for effective environmental education for the Nation's young people. The intensive concern over adequate energy resources, the continuing degradation of our air and water, and the discussion over the economic costs of the war against pollution have all brought the question of the environmental quality of this nation to a concern not merely of aesthetics but of the survival of the human race.

The intense interest by the public in the quality of our lives as affected by the environment clearly indicates that we cannot just use incentives and prescriptions to industry and other sources of pollution. That is necessary, but not sufficient." The race between education and catastrophe can be won by education if we marshall our resources in a systematic manner and squarely confront the long-term approach to saving our environment through the process of education.

As the incessant conqueror of nature, we must reexamine our place and role. Our world is no longer an endless frontier. We constantly are feeling the backlash from many of our ill-conceived efforts to achieve progress.

Rachel Carson's theme of "reverence for life" is becoming less mystical and of more substance as our eyes are opened to much of the havoc we have wrought under the guise of progress. A strong commitment to an all-embracing program of environmental education will help us to find that new working definition of progress that is a pre-requisite to the continued presence of life on this planet.

- Senator Gaylord Nelson

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MATH PREFACE

Many people believe that any and every facet of environmental education relates only to science. They seldom associate environmental problems as their problems. It is hoped that this misconception will be rectified with the exercises provided in this booklet. The writers tried to implement environmental education in all areas of the curriculum because the environmental problems involve any and all subject areas. Another reason for developing environmental awareness is that man influences and is influenced by the environment, either directly or indirectly.

The supplementary guide is designed to be an addition to the curriculum and not to replace it. The guide should make the students and teachers aware of our environmental problems. Although the exercises listed in this booklet are designed for junior high school mathematics, revision by the instructor can result in the material being used at a higher or lower instructional level. It is also intended that the users will understand the relationship between ecology and mathematics. For example, in one of the exercises, the student can determine the amount of fresh water that is needed in the United States as compared to the amount of fresh water that is available. The lesson draws the student's attention to the importance of water and its availability, and if man continues to waste it, what will the outcome be?

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DIRECTIONS FOR USING THIS GUIDE

This guide contains a series of episodes (mini-lesson plans), each containing a number of suggested in and out of class learning activities. The episodes are built around 12 major environmental concepts that form a framework for each grade or subject area, as well as for the entire K-12 program. Further, each episode offers subject area integration, multi-disciplinary activities, where applicable, both cognitive and affective behavioral objectives and suggested reference and resource materials useful to the teacher and students.

1. This I-C-E guide is supplementary in design--it is not a complete course of study, nor is its arrangement sequential. You can teach environmentally within the context of your course of study or units by integrating the many ideas and activities suggested.

2. The suggested learning activities are departures from regular text or curriculum programs, while providing for skill development.

3. You decide when any concepts, objectives, activities and resources can conveniently be included in your unit.

4. All episodes can be adapted, modified, or expanded thereby providing great flexibility for any teaching situation.

5. While each grade level or subject area has its own topic or unit emphasis, inter-grade coordination or subject area articulation to avoid duplication and overlap is highly recommended for any school or district seeking effective implementation.

This total K-12 environmental education series is the product of 235 classroom teachers from Northeastern Wisconsin. They created, used, revised and edited these guides over a period of four years. To this first step in the 1,000 mile journey of human survival, we invite you to take the second step--by using this guide and by adding your own inspirations along the way.

PROJECT I-C-E TWELVE MAJOR ENVIRONMENTAL CONCEPTS

1. The sun is the basic source of energy on earth. Transformation of sun energy to other energy forms (often begun by plant photosynthesis) provides food, fuel and power for life systems and machines.

2. All living organisms interact among themselves and their environment, forming an intricate unit called an ecosystem.

3. Environmental factors are limiting on the numbers of organisms living within their influence. Thus, each ecosystem has a carrying capacity.

4. An adequate supply of clean water is essential to life.

5. An adequate supply of clean air is essential for life.

6. The distribution of natural resources and the interaction of physical environmental factors greatly affect the quality of life.

7. Factors such as facilitating transportation, economic conditions, population growth and increased leisure time influence changes in land use and population densities.

8. Cultural, economic, social, and political factors determine man's values and attitudes toward his environment.

9. Man has the ability to manage, manipulate and change his environment.

10. Short-term economic gains may produce long-term environmental losses.

11. Individual acts, duplicated or compounded, produce significant environmental alterations over time.

12. Each person must exercise stewardship of the earth for the benefit of mankind.

A "Concept Rationale" booklet and a slide/tape program "Man Needs His Environment" are available from the I-C-E RMC to more fully explain these concepts.

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Environmental:

Integrated with:

CONCEPT NO. 1 - Energy

SUBJECT Mathematics

ORIENTATION Sunlight and Shadows

TOPIC/UNIT Proportion

BEHAVIORAL OBJECTIVES

Cognitive:

Demonstrate how the solution of several problems using proportions to discover how the use of shadows on a sunny day will aid in obtaining the approximate height of tall objects.

Affective:

Demonstrate awareness of how the sun's rays will be useful in estimating height by suggesting this method when the height of an object is desired.

Skills Used:

1. Use of ratio
2. Use of yardsticks and metersticks for making measurements
3. The ideas of right angles and right triangles

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. A vertical object forms a right angle at its base with its shadow. A right triangle is formed if you think of an imaginery line from the tip of the shadow to the top of the object. The size of the angle formed at the tip of the shadow with the top of the object is the same for all vertical objects at the same time of day. Triangles thus formed are equal. Then the ratios of the corresponding sides of the triangles are equal.

B. Given Prolems:
(These activities should aiso be done with a meterstick. 1" = 2.54 cm.)
1. Find the height of a tree that casts a shadow 12 feet long at the same time of day that a yardstick casts a shadow 1 foot long. The ratio of the shadow of the tree to the yardstick is 12 to 1. Then the height of the tree is 12 times the yardstick or _____ feet.

(Continued)

Outside or Community:

A. Using ratio find the height of:
1. Your church
2. Your city water tower
3. Your school's flagpole
4. Trees, basketball hoops, playground equipment, etc. found near school or home

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Darling, Lois, Place In The Sun - Ecology and the Living World, Morrow, 1968, $3.95.
Reinow, Robert, Moment In The Sun (Report) Ballantine 1967, 95¢.

Audio-Visual:

Film #230, A World Is Born, I-C-E RMC.

Community:

CLASSROOM: (Continued)

B. 2. Find the height of an electric light pole that casts a shadow 5 ft. long at the same time that a 6 ft. pole casts a shadow 2 ft. long.
3. Mark knows that he is 5 ft. 4 in. tall. At the same time that he casts a 16 in. shadow, Harry casts a 12 in. shadow. How tall is Harry?
4. When a vertical pole 20 ft. high casts a shadow 15 ft. long, how tall is Jean, who casts a 3 ft. long shadow?
5. How high is a church spire that casts a shadow 120 ft. long at the same time that a yardstick casts a shadow 6 ft. long?
6. When a tree casts a shadow 60 ft. long, a 9 ft. post casts a shadow 10 ft. long. How high is the tree?
7. A 60 ft. flagstaff casts a shadow 24 ft. long. At the same time, how long a shadow will Jerry cast if he is 5 feet tall?
8. Find the height of building casting a 28 foot shadow when a boy 5 feet tall casts a 2 foot shadow.
9. A tower casts a shadow 75 ft. long at the same time a pole 10 ft. high casts a shadow 6 feet long. What is the height of the tower?
10. A telephone pole casts a shadow 30 feet long. At the same time a stick 5 ft. high casts a shadow 6 ft. long. What is the height of the pole?

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Environmental: **Integrated with:**

CONCEPT NO. 2 - Ecosystem **SUBJECT** Mathematics

ORIENTATION Wildlife Population **TOPIC/UNIT** Proportion, Area and Percent

BEHAVIORAL OBJECTIVES

Cognitive:

Identify five good conservation practices which will encourage wildlife production. Analyze several practices commonly seen in farming areas; in new subdivisions, that change the type and/or amount of cover, and classify this as helpful or harmful to the wildlife in the area.

Affective:

Solving given examples that indicate the importance of emphasizing the value of conservation in saving wildlife.

Skills Used.

1. Read and interpret facts.
2. Make comparisons
3. Problem solving

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. General Information
1. Man is dependent on wildlife for food and pleasure. Wildlife depends on habits of man for his continued existence. When streams are polluted, natural habitat destroyed, and pesticides used thoughtlessly, wildlife becomes extinct. In 1968 there were 68 endangered species; in 1970 the number rose to 89; in 1971 - 102.
2. A million acres of wildlife habitat was lost to agriculture in 1970, another million will be cleared in 1971. There are only 30 million acres in refuges out of the 2 1/4 billion acres in U.S. Happily, farmers are taking steps to turn the tide toward wildlife.
3. The canvasback duck has declined 25% annually, the Cooper's hawk declined 25%, the California condor 50% and the loveliest of our songbirds, the bluebird, is now considered the "most rare." Our only hope is conservation.

Outside or Community:

A. Visit and explore a local tree farm. Identify how wildlife production is affected by forestry management.

B. Visit a man-made pond. Observe what wildlife is evident about it. How is it protected from erosion, pollution and pesticides?

C. Locate an area (nearby school or local situation) where a wildlife region could be set up. Form a committee to make plans to develop it. Invite the city park director to speak about the city's plans. Also use (#23) ICE Field Activity, A Land Ethic.

D. A D.N.R. rep. may discuss problems and successes of wild life management in your area.

(Continued)

SUGGESTED RESOURCES

Publications:

National Wildlife Federation EQ Index, 1971, I-C-E Rmc.
More Wildlife Through Soil and Water Conservation - 175
Soil Conservation Service
U. S. Dept. of Agriculture.
Book: 105 Hi - Hine, Ruth L.
Endangered Species In Wisconsin,
I-C-E RMC.

(Continued)

Audio-Visual:

Our Endangered Wildlife,
51 minutes, color, McGraw-Hill
Contemporary Films,
330 W. 42nd St., N.Y. 10018
One Day at Teton Marsh, #200 I-C-E RMC.
I-C-E Field Activity, A Land Ethic.

Community:

1. City personnel in charge of parks and/or recreation
2. DNR representative

CONTINUED OR ADDED LEARNING ACTIVITIES

CLASSROOM: (Continued)

A. 4. A well-planned pond produces about 200 pounds of fish per acre. We are stocking about 50,000 ponds a year. They exceed 150,000 acres. At 85% of these ponds, a goodly number of rabbits have been observed, doves at 65%, quail at 55% and muskrats at 63%. They harbored 141,000 wild ducks.

5. Windbreaks are being planted at the rate of 4,000 miles per year. They provide cover for the ringnecked pheasant and song birds. Farmers are planting at the rate of 910,000 acres of trees annually. A good cover for deer, rabbits, grouse, and squirrels. "Odd Areas" such as rocky spots, sinkholes, old pits or fence corners, have been allowed to grow up into wildlife habitat.

B. Use the above information to solve the following problems.

1. The endangered species of 1968 is how many less than in 1970? This is an average rate of about how many a year? If this rate continues, how many species would be listed by 1975?
2. What part of the area of U.S. is in wildlife refuge today?
3. If the canvasback duck is allowed to decline at the given rate, in how many years will it be extinct? The California Condor?
4. At the rate of 200 pounds of fish per acre, what production could we expect from the fish ponds established yearly?
5. If 4,000 miles of windbreak are planted yearly, give the ratio for five years. Ten years.
6. Evergreen trees are planted 6 feet apart. How many trees are required for an acre? For 910,000 acres?
7. Given 20 rabbits spotted at each pond, how many rabbits could be expected in all the ponds (50,000) established in a year?
8. A female grouse usually lays 12 eggs. Of these, 10 successfully hatch. What part of the lay hatches? What would be the ratio for 30 females?
9. Student groups (4-5) will graph/chart the ratios calculated above for classroom display and impact.

(Continued)

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications:	CLASSROOM: (Continued) C. Extended Activity (International) 1. What about the number of endangered species in the world? In general, then how many of each type: birds, animals, etc. 2. What is the percentage of wildlife refuge in the world? PUBLICATIONS: (Continued) Committees 1. Dept. of Natural Resources P. O. Box 450 Madison, Wisconsin 53701 2. American Comm. for International Wildlife Protection, Inc. c/o National Audubon Society 1130 Fifth Avenue New York, New York 10028 3. International Union for the Conservation of Nature and Natural Resources (IUCN) Morgan, Switzerland
Audio–Visual:	
Community:	

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental:

CONCEPT NO. 3 - Carrying Capacity

Integrated with:

ORIENTATION Interdependency

SUBJECT Mathematics

TOPIC/UNIT Computation

BEHAVIORAL OBJECTIVES

Cognitive:

Explain, through the use of calculations, how land use, food supply and population growth are interrelated. Predict the probable effect on the other two factors that will result from the given change in one of the interrelated factors.

Affective:

Appreciate the values of careful stewardship of our natural environment by citing examples. Suggest a plan of stewardship for a park or other public land which will enable it to be preserved in its present status for the next generation.

Skills Used:

1. An understanding of large numbers
2. Effective reasoning
3. An understanding of the great sacrifice interstate highways inflict on our amount of cropland.

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. During the 20 years from 1790 to 1810, the population of U.S. increased from 3,929,000 to 7,239,000. During the 20 years from 1950 to 1970, the population increased from 150,697,000 to 207,000,000.
   1. What was the population increase from 1790 to 1810?
   2. What was the increase from 1950 to 1970?
   3. How much greater was the increase per year from 1950 to 1970 than from 1790 to 1810?
   4. What was the average increase per year from 1950 to 1970?
   5. Extended Activity:
   With the new attitudes on population, what trends (by percentages, averages, etc.) and comparisons can be set for 1975? 1980?

B. The average consumption of beef per capita is 106.6 pounds of carcass weight.
   1. Using the facts in A, how many pounds of beef were consumed in U.S. in 1970?
   2. If each animal weighs about 1000 pounds, how many were needed to produce the beef needed back in 1970?

(Continued)

Outside or Community:

A. Compare the population growth in your community from 1950 to 1970. What is the projected population for 1980?

B. Check highway construction sites in your area.
   1. Are they using wasteland or farmland?
   2. How many acres?
   3. Will their construction disrupt wildlife and/or destroy productive land?

C. Interview a beef producer to learn facts to calculate the amount of hay or grain an animal 1 1/2 years old would consume.

Sample Questions:
   1. How much hay does a beef animal consume a day?
   2. What grain is included in a beef animal's ration?
   3. In what proportion?
   4. How many pounds of grain feed is fed per day?
   5. How has the recent beef shortage affected prices (raising, marketing, etc.)

SUGGESTED RESOURCES

Publications:

Pollution Problems and Projects, Wisconsin Department of Instruction, Madison, Wisconsin.
Wisconsin Survival Handbook, Wisconsin Environment Decade, Racine, Wisconsin.
Lappe', Frances Moore, Diet for a Small Plant, Ballantine Book 02378, $1.25.

Audio-Visual:

Population Explosion, 43 minutes, Carousel Films, Inc., 1501.
Our Vanishing Land, McGraw-Hill Contemporary Films, 330 W. 42nd Street N.Y., N.Y. 10018.
SG 10 - New Highway Game, I-C-E, RMC.

Community:

Highway Department
Local Beef Producer

CONTINUED OR ADDED LEARNING ACTIVITIES

CLASSROOM: (Continued)

B. 3. If the projected consumption of beef is 117 pounds per person in 1980, and the projected population is 270 million, how many 1000-pound animals will be needed to supply it?
4. If each day, one of these animals drinks 12 gallons of water, how many gallons will be used a day? In the 1 1/2 years of its life?
5. If each animal in 1980 produced 23,600 grams of waste per day, then how many metric tons of waste will be produced in 1 1/2 years?

C. From 1963 to 1967, 28.6 square miles of land in seven southwestern counties of Wisconsin were consumed by urban sprawl. Of this amount, 19.7 square miles were productive farmland.
1. What percent of the land lost was productive farmland?
2. How many acres of cropland was this?
3. Extended Activity:
What percent of our land is now being lost to urban sprawl?

D. The interstate highway system uses up 50 acres of cropland per mile of highway.
1. At this rate, how many acres of Wisconsin land was used for the interstate highway from Beloit to St. Paul, a distance of 304 miles?
2. Simulation game - New Highway Game.

E. At this rate of farmland loss (C and D) is there any danger of American people going hungry in future years if our population and interstate highway growth continue at this rate?

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

CONCEPT NO. 4 - Water

ORIENTATION Water Needs

Integrated with:

SUBJECT Mathematics

TOPIC/UNIT Percentage and Whole Numbers

BEHAVIORAL OBJECTIVES

Cognitive:

Determine the uses and cost of water in our daily lives - in the home, in industry, in communication, through calculations using data available from water use industries or government agencies.

Affective:

Demonstrate awareness of the many gallons of pure water necessary for normal living, and the need for conserving water by calculating the water used by his family in a week. Advocate the reduction of water usage by his family as a way of reducing the pure water needs and costs in his community.

Skills Used:

1. The practical use of percent
2. Use of cubic measure (English and Metric)
3. Dependency of a community on its supply of pure water
4. Interpreting facts
5. Rounding off numbers

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. The average American uses 60 gallons of water per day in the home, in the following ways:

flushing toilets	41%
washing & bathing	37%
kitchen use	6%
watering	3%
drinking	5%
washing clothes	4%
general cleaning	3%
washing cars	1%

1. To the nearest whole number how many gallons are used for each purpose?
2. How much would one person use in a week? Your family? How much in a week? How much in a year?

B. To meet the needs of the average community, a water utility must supply 150 gallons of clean water per person/per day. Use the population of your community to compute the amount of water that must be produced by the water utility--each day, each week, each month, each year.

C. The loss of water in the home is 1/2 cubic foot in 15 minutes. How many gallons would be lost in a day?

(Continued)

Outside or Community:

A. Obtain a copy of the water rates of your community.
1. Figure the value of the water you use in a month. In a year.
2. Does your community have an adequate water supply? For how long with the present usage rate?

B. Weigh a dozen daily newspapers. In the paper, find the number of papers circulated daily. Using the information in Problem"E" find the amount of water needed to produce one daily copy.

C. Visit your community water supply. How is its purity insured? If you live in a rural area, how can you be sure your water is pure?

D. Place a pan in the washbowl before you brush your teeth. Allow the water to run while you brush them. How much water did you use? How much could you have saved if you had used a glass of water? How much would you save in a year?

SUGGESTED RESOURCES

Publications:

Pollution: Problems, Projects, and Mathematics Exercises, Bulletin #1082, Wisconsin Dept. of Public Instruction 126 Langden St., Madison, Wisconsin.
1971 EQ Index, I-C-E RMC.
125 BS 1-19, Broad Spectrum Environmental Education Project, I-C-E RMC.
140 So, Water Use: Principles and Guidelines for Planning and Management in Wisconsin.

Federal Agencies: (Continued)

Audio-Visual:

Water Famine, Carousel Films, Inc. 1501 Broadway, N. Y., N. Y. 10035.
Problem With Water is People, 30 minutes, color, McGraw-Hill Contemporary Films, 330 W. 42nd St., N.Y., N.Y. 10018.
The Gifts, #280, I-C-E RMC.
The Stream, #320, I-C-E RMC.

Community:

City Water Dept. or other supply

CONTINUED OR ADDED LEARNING ACTIVITIES

CLASSROOM: (Continued)

D. Commercial operations use about 20 gallons of water per day/per person. How many days are needed to use 600 gallons of water per person?
E. The paper industry uses about 90,000 gallons of water for each ton of paper produced.
   1. How many gallons does it take to produce one pound of paper?
   2. If 53 million tons of paper is produced each year, then how many gallons of water would be used in a year?
   3. There are 7 1/2 gallons of water in a cubic foot. How many cubic feet of water was used in problem 2?

PUBLICATIONS: (Continued)

Federal Agencies:

1. National Water Commission
   800 N. Quincy Street
   Arlington, Virginia 22203

2. Federal Water Quality Admin.
   Washington, D.C. 20242

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 5 - Air

SUBJECT Mathematics

ORIENTATION Air Pollution

TOPIC/UNIT Computation

BEHAVIORAL OBJECTIVES

Cognitive:

Compute the amount of air pollutants created by transportation and its relation to respiratory diseases.

Affective:

Demonstrate awareness of the causes of air pollution in his community by listing sources in his immediate environment. Advocate the inspection of automobile exhaust systems as a method of reducing air pollution, if those not meeting standards are removed from use until they are improved. (Continued)

Skills Used:

1. Working word problems
2. Review of addition
   subtraction
   multiplication
   division

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Causes:
   1. A 1965 automobile of a certain make and model pollutes the air 5 times as much as a 1970 automobile of the same make and model. The 1965 auto started at the beginning of a section of highway traveling 50 mph at a steady rate. Two hours later, the 1970 automobile started at the same place and traveled in the same direction at a steady rate of 65 mph. If the 1970 car pollutes the air at the rate of n cubic feet per hour, how many n cubic feet of pollutants were emitted by each car by the time the 1970 car caught up to the 1965 car?
   2. In 1967, U.S. passenger cars totaled 80,414,000. They emitted 61,000,000 tons of carbon monoxide into the air.
      a. On an average, each car was responsible for emitting how much carbon monoxide into the air?

(Continued)

Outside or Community:

A. Make plans to take a count of cars traveling certain routes at certain hours, on various days in your community.

ICE Field Activity:
(Don't use Traffic Jam or Peanut Butter Sandwiches)

1. Go to the location you have chosen. Count the cars traveling in one direction and the number of passengers in each car. Do this for 1/2 hour during a morning rush hour, 1/2 hour during evening rush hour, and 1/2 hour during a mid-day hour, for one week.
2. When you arrive at what you feel is a fair sampling, determine how many fewer cars would have been needed if each car would have carried 3 passengers.
3. Determine what percent of the cars carried only 1 person, 2 persons, 3 persons, more than 3 persons.
4. What conclusions can you form as an individual or as a group carrying out this project?

(Continued)

SUGGESTED RESOURCES

Publications:

Pollution: Problems, Projects, and Mathematics Exercises, Bulletin #1082, Wisconsin Dept. of Public Instruction 126 Langden St., Madison, Wisconsin.
The Automobile and Air Pollution: A Program For Progress (Part I and II) $1.60, Government Printing Office, 1967.
Pamphlet - Air Pollution: The Facts, Metro Clean Air Committee, 1803 Portland Avenue, Minneapolis, Minn. 55404 .

Audio-Visual:

Air Pollution: Take a Deep Deadly Breath, 3 parts, 54 minutes, color, free, Wisconsin Tuberculosis and Respiratory Disease Association, Publication Department, Box 424, Milwaukee, Wisconsin 53201.
Poisoned Air, (discussion with auto and oil company, 50 minutes, McGraw-Hill Contemporary Films, 330 W. 42nd St., N. Y., N.Y. 10018.
#460, The 2nd Pollution, 22 minutes, I-C-E RMC.

Community:

1. City Transportation Dept.
2. Carpool Assoc.

CONTINUED OR ADDED LEARNING ACTIVITIES

AFFECTIVE: (Continued)

Promote the use of carpools and public transportation as ways of reducing air pollution.

CLASSROOM: (Continued)

A. 2. b. At that rate, 1 person driving a car for 50 years, would have caused how much carbon monoxide to pollute the air?

c. Using the following statistics, answer the same two questions for these chemicals:

Hydrocarbons	16,000,000 tons in 1967
Nitrogen Oxides	6,000,000 tons in 1967
Lead	210,000 tons in 1967

3. A 1965 automobile emits an average of 900 parts per million of hydrocarbons in its exhaust to pollute the air. A 1970 automobile emits a corresponding 180 parts per million. About how many 1970 autos does it take to pollute the air with hydrocarbons as much as one 1965 auto.
4. At the time of takeoff, a four-engine jet pours out 88 pounds of air pollutants. If such a plane takes off every minute from an airport, how many pounds of pollutants are poured out into the air in 1 hour? In 1 day? In 1 week? In 1 month (30 days)? In 1 year? Convert all these answers to tons.

B. Results:

1. When the sulfur dioxide content of the air in N.Y. City rises above 0.2 parts per million, 10 to 20 people die as a result. In the 5 years, 1965 to 1970, sulfur dioxide reached this level once every 10 days.
   a. What was the minimum number of people who died in N.Y. City during the 5 years, 1965 to 1970, as a result of air pollution by sulfur dioxide?
   b. What was the maximum number of people who dies in N.Y. City during the 5 years, 1965 to 1970, as a result of air pollution by sulfur dioxide?

(Continued)

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications:	CLASSROOM: (Continued)
Audio–Visual:	B. 2. Aggravated by air pollutants, emphysema is the fastest growing cause of death in our country today. In the ten-year period from 1950 through 1959, deaths among males from emphysema rose from 1.5 per hundred thousand to 8 per hundred thousand. This total has increased steadily. In 1970, the population of the U. S. was 203 million, and 50,000 persons died from emphysema. How many people per hundred thousand died from emphysema? 3. In 1949, New York City had the most polluted air and the highest death rate from pneumonia in the state of New York--31.5 per 100,000 population. In 11 up-state cities with much cleaner air, the rate was only 23.9 per 100,000. In rural areas, where pollution was least, the death rate was lower still--16.9. In 1959, all rates increased. Then New York City had had 50.6 pneumonic deaths per 100,000; the up-state cities had 38.6 and the rural areas had 29.2. a. What was the rate of increase in New York City from 1949 to 1959? b. How much higher was the rate in New York City than the rural areas in 1949? 4. Air Pollution Kills Death rates from diseases associated with air are climbing. Reproduced from: National Wildlife Federation 1971 EQ Index 1412 - 16th Street, N.W. Washington, D.C. 20036
Community:	

(Continued)

OUTSIDE OR COMMUNITY: (Continued)

4. Can you use these conclusions to make some recommendations to your own family (families)? To the staff of your school? Members of your community, traffic department?
   A.

WHO, WHAT, WHERE, WHY AND HOW OF AIR POLLUTION (Note at bottom of this page)

Pollutant	Main Source	Effect on Health	Minimum Standards	ESP'S RECOMMENDED Action
Sulfur Oxide	Electric plants	a. Irritates respiratory tract b. Damage lungs	80 micrograms	Shift to natural gas
Particulates	Smoke, Soot, fly ash, power plant	a. Damage lungs b. Cause gastric cancer	75 micrograms cu. m.	Burn cleaner fuel
Carbon Monoxide	Autos, trucks, buses	a. Slows reactions b. Damages heart	9 parts/million, max. 8 hr. concentration once a year	New devices for auto engines; limit traffic in some cities
Hydrocarbons	Refineries and automobiles	Not toxic, but contribute to smog	0.24 parts/million max. in 3 years once a year	Automobiles must reduce hydrocarbon emission by more than 90% by 1975
Nitrogen Oxides	High-temp. combustion in engines, furnaces	Increase susceptibility to influenza	0.05 parts/million as the annual mean	Autos must start reducing nitrogen oxide emission by 1973; reducing to 90% by 1976
Photochemical-Oxidants	Sunlight on hydrocarbons and nitrogen oxides from engines, furnaces	a. Irritate eyes b. Increase asthma attacks	0.08 parts/million max. 1 hr. concentration each year	New Auto Standards will help change industrial processes

*NOTE: Environmental Protection Agency has prepared tough air quality standards, based on public health values. States have until end of January 1972, to submit plans for meeting them. But final deadline for meeting all standards is July 1, 1975.

Above table taken from:
National Wildlife Federation,
1971 EQ Index, page 6.

(Continued)

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: **Audio–Visual:** **Community:**	OUTSIDE OR COMMUNITY: (Continued) B. Field trip to the City Department of Transportation. Questions: 1. What is the department doing to limit (discourage) auto usage? 2. City bus system: a. How many buses and their capacity? b. Average number of passengers per day? c. Cost to efficiently run the system? 3. What are some other forms of transportation? C. Carpools: 1. Does your community have a carpool organization? If yes, how is it organized? 2. Does any industrial plant encourage usage of carpools? If yes, by what means? D. Make a community survey of the types of air pollutants and the amount released of each (approx.). Use a table or bar graph to show the results.

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental:

Integrated with:

CONCEPT NO. 6 - Resources

SUBJECT Mathematics

ORIENTATION Supply and Demand of Water

TOPIC/UNIT Measurement and Computation

BEHAVIORAL OBJECTIVES

Cognitive:

Calculate the nation's average electrical needs and estimate the average cost per month, per year. Explain why controlled and timed usage of electrical appliances can be used as a way of reducing the possibility of brown outs or black outs.

Affective:

Promote the significance of water control for man's survival in his environment. Continually advocate that selection of modern appliances be based on amount and efficiency of electricity used.

Skills Used:

1. Data gathering
2. Finding averages
3. Rounding numbers

STUDENT-CENTERED LEARNING ACTIVITIES

In Class:

A. Worksheet: Cost of Electricity (see attached sheet).
B. The follow-up (of work-sheet) will be the amount of water needed to handle the given amounts of electricity and is there a supply of H_2O to avoid black outs, restricted use of appliances, etc.
C. Research and compute the total amount of electricity used by air conditioners during the summer compared to the amount used by electrical heaters during the winter.

Outside or Community:

A. The students can study their own community, its rise of electricity and its cost per family and per person. Have a representative from the electric company explain the meaning of an electric bill and how the costs are estimated.
B. Is there sufficient water resources to handle all their community's needs today? Next year? Ten years? This information may be obtained by:
   1. a field trip to the local power plant, or
   2. have a representative from the electrical (power) company speak to the class.

SUGGESTED RESOURCES

Publications:

Overman, Michael, Water: Solutions To A Problem of Supply and Demand, Doubleday Science Series, 628.1, 1969 paperback $2.45.
Helfman, Elizabeth, Rivers and Watersheds in America's Future, McKay, 1965 $4.95 (333.72).
Abrahamson, Dean E.,"Environmental cost of Electric Power," A Scientists Institute for Public Information Workbook, 1970.

(Continued)

Audio-Visual:

Clean Waters, (20 minutes), National Medical Audio-Visual Center, Chamblee, Georgia 30005.
Problem with Water is People, 30 minutes, color on request, McGraw-Hill Contemporary Films, 330 W. 42nd Street, N.Y., N.Y. 10018.
Natures Half Acre, #210, I-C-E RMC.

Community:

Electric Power Company
City Hall
DNR

CONTINUED OR ADDED LEARNING ACTIVITIES

PUBLICATIONS: (Continued)

Ecology Today (magazine), "Water: Get it While You Can," from May 1, June 1, 1972, issue.
Knox, Susan, The Energy Crisis Survival Kit, Manor Books, $1.65.

Federal Agencies:

1. Federal Power Commission
   441 G St., N.W.
   Washington, D. C. 20426
   (regulates charges for gas and electricity)

2. National Water Commission
   Quincy Street
   Arlington, Virginia 22203
   (reviews water resource requirements and development)

Numbers in the News **BEST COPY AVAILABLE** Subject: Cost of Electricity

The Edison Electric Institute has released information regarding the cost of electricity for various home appliances. The cost does vary depending upon the area; however, the national average is about $.021 per kilowatt hour. The information below is based on an average family and the $.021 average cost per *kilowatt hour.

Appliance	Average Kilowatt Hours Used Per Year	Average Annual Cost	Average Cost Per Month
Hot Water Heater	4,219	$88.60	$ 7.38
Refrigerator-Freezer (14 cubic Ft. - frostless)	1,829	(A) 38.41	(B) 3.19/3.20
Electric Range	1,175	(C) 24.68	(D) 2.06
Clothes Dryer	993	(E) 20.85	(F) 1.74
Television Set			
Black and White	362	(G) 7.60	(H) .63
Color	502	(I) 10.54	(J) .88
Dishwasher	363	(K) 7.62	(L) .64/.65
Iron	144	(M) 3.02	(N) .25
Coffee Maker	106	(O) 2.23	(P) .19
Automatic Washer	103	(Q) 2.16	(R) .18/.19
Radio	86	(S) 1.81	(T) .15
Vacuum Cleaner	48	(U) 1.01	(V) .08
Toaster	39	(W) .82	(X) .07/.06

*The term "kilowatt" is from the prefix "kilo" meaning thousand and the word "watt" which is a measurement of electrical power. A kilowatt then, is a thousand watts. A "kilowatt hour" is the amount of electricity used by one 100 watt bulb that burns for ten hours.

COMPUTE TO NEAREST CENT

1. What are the totals for the following food equipment appliances? (refrigerator, range, coffee maker, dishwasher, toaster)
   Kilowatt hrs: 3512 Cost per year: $73.75; Cost per month $6.15 or $6.16.

2. What are the totals for the following cleaning equipment? (clothes dryer, automatic washer, vacuum cleaner)
   Kilowatt hrs: 1144 Cost per year: $24.02; Cost per month: $2.00.

3. How much more does it cost for electricity for a color TV set than a black and white set for one year? $2.94.

4. What would be the appliance portion of the electric bill for one month for a family with all appliances listed above? (Include one color TV and no black and white TV set.) $16.82.

5. What would the cost total to operate the following for six hours: four 150 watt bulbs, three 100 watt bulbs, one 60 watt bulb, and one 40 watt bulb? $.126 or 12.6¢.

6. What would be the electric light bill for one month (30 days) assuming the same amount of electric light usage per day as listed in problem #5. $3.78.

Copr. Christopher Lee Publications 1972 - P. O. Box 331, Glencoe, Illinois 60022.

E. S. E. A. Title III - PROJECT I-C-E 59-70-0135-4

Environmental: **Integrated with:**

CONCEPT NO. 7 - Land Use **SUBJECT** Mathematics

ORIENTATION Land Use & Human Population **TOPIC/UNIT** Percent

BEHAVIORAL OBJECTIVES

Cognitive:

Express changes in land use and changes in centers of population density in percents. Predict, by extrapolation of percentage changes over the last 20 years, the land uses and population centers in the year 2000.

Affective:

Demonstrate awareness of changes in land use and population density in his own area or community within the last 10 years by describing several examples that illustrate the need for proper planning and laws regulating change within his community.

Skills Used:

1. Observation
2. Investigation
3. Research
4. Comparing
5. Reporting

(Continued)

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. Using local voter registration figures, student will show % of increase or decrease in voter population. (These figures can be obtained from the voter registration office.)

B. Using school enrollment figures compute and show % of increase or decrease in school population from one year or period to another. (These figures can be obtained from the district office.)

C. Using USDA figures in land use change (acres or square miles) use percent in expressing land use change (i.e. "urban sprawl" vs. corn fields).

D. Use data given in class by guest speakers to find percent of change. (See outside activities.)

E. Simulation Activity, I-C-E Field Activity Guide - Land Use.

Outside or Community:

A. Invite Principal or Superintendent of Schools to give a talk to class on school enrollment changes and problems that have resulted.
Questions:
1. What is the present school enrollment?
2. What is the general trend in enrollment and for which grades, etc.

B. Invite Chief of Police or Sheriff to talk to class on changes in methods or problems involving law enforcement resulting from population change.
Questions:
1. With population change, does the force hire more men or just change the routes of the present force?
2. How is the force size determined?

C. Invite County Agent to talk to class on change in local county land use and problems resulting from these changes.
Questions:
1. How much land is being used for farming compared to city use and to recreation?

(Continued)

SUGGESTED RESOURCES

Publications:

A Different Kind of Country,
2nd Ed., Wiley, 1968.
Statistical Abstracts from School Libraries.
U. S. Government Printing Office reprints.
190 Ki 1-4, Kimball, Richard, poster series on population problems
I-C-E RMC.

Audio-Visual:

People Our Most Valuable Resource,
McGraw-Hill Company.
The City and the Future,
Sterling Educational Films.
All Kinds of People, 13 minutes,
$5.00, color, #3999 BAVI.
#230 Family Planning, I-C-E RMC.

Community:

Farmer
Industrialist
Police Department
Principal or Superintendent of Schools

CONTINUED OR ADDED LEARNING ACTIVITIES

SKILLS USED: (Continued)

6. Reflection
7. Making judgments
8. Establishing conclusions

OUTSIDE OR COMMUNITY: (Continued)

C. 2. What general trends are developing in land use in the county?
D. Invite Farmer to speak to class.
   Questions:
   1. The size of his farm and how many acres are used in his farm operations.
   2. The cost of running a farm and how the new shortages (grain, beef, etc.) have affected his farm.
E. Invite an Industrialist to speak to class.
   Questions:
   1. Size of plant in terms of land and the size in terms of employees (office and factory).
   2. Is there a plan(s) to expand the plant and what is involved with the expansion (land, people, etc.).

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental: Integrated with:

CONCEPT NO. 7 - Land Use SUBJECT Mathematics

ORIENTATION Population Growth TOPIC/UNIT Graphs

BEHAVIORAL OBJECTIVES

Cognitive:

Compare the growth of America over the last century by constructing and reading graphs. Predict the population of the U.S. in the year 2000 based on the present birth, death, immigration, and emmigration figures.

Affective:

Criticize the rapid growth of the population in this nation, and its impact on food, housing, and educational problems.

Skills Used:

1. Types of graphs
2. Graph construction
3. Locating statistics

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

I.

A. Use a bar graph to show the population growth (by 10-year periods) starting 1870 to present. The data for the graph may be obtained from the Bureau of Census, Blue Books, Encyclopedias, etc. Suggest assigning a student or groups of students to write for the information from the Bureau or most of the data should be obtainable from the community (school) library.

B. Use a line graph to show the growth in wheat production (in bushels) over the same period of years. Bring in the shortage and how if has affected the crop.

C. Use a pictorial graph to show the immigration of people within the U.S. in the last 30 years.

D. Show by the use of a graph, the decrease in the number of people engaged in farming since 1940.

E. How have the trends (A-D) affected the educational systems?

(Continued)

Outside or Community:

II.

A. Graph the growth of your community in the last 100 years.

B. Visit the ASC office to learn the agricultural trend in your own community.
   1. How many farms are in the area now? 5 yrs. ago? 10 yrs. ago? 100 years ago?
   2. How much land is used for agriculture compared to family and commercial living?

C. How has the cost of education affected the local taxes? (Graph)

D. Use Social Studies or History teacher as an additional resource.

E. Contrast the growth of the (U.S.) nation to your own community by interpretations of the graphs in parts I (A) and II (A).

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES
Publications: Bureau of Census (Reports) Encyclopedias *Pollution: Problems, Projects and Mathematics Exercises, Grades 6-9 Wisconsin Dept. of Public Instruction, #1082, 126 Langden, Madison, Wisconsin. **Audio–Visual:** **Community:** Library City (Town) Clerk	PUBLICATIONS: (Continued) (Comparison to another country, such as India.) *NOTE: Every school in the state of Wisconsin was issued a copy of this paper-bound book. CLASSROOM: (Continued) F. Pollution Problems Suggested; Lesson 4, p. 27 Lesson 5, pp. 9-10 Lesson 8, p. 13 Lesson 7, p. 30

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 8 - Values and Attitudes

SUBJECT Mathematics

ORIENTATION Pollution Costs

TOPIC/UNIT Computation

BEHAVIORAL OBJECTIVES

Cognitive:

Calculate the cost of air and water pollution. Compare cost of air and water pollution to cost of a community clean-up program, by solving simple problems.

Affective:

Appreciate the fact that polluted air is not good for people and not necessary for progress. Promote the right of everyone to breathe clean air.

Skills Used:

1. An understanding of the term "net" in net annual savings.
2. Basic subtraction and addition

(Continued)

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Some people say that the cost to clean up our nation's air and water will be too high. The National Wildlife Federation has studied the problem and provided these statistics:

Air pollution damage in 1972 will amount to $16.1 billion or an average of $368 per family. Water pollution damage in 1972 will be $12.8 billion or an average of $213 per family. An air clean-up program would reduce annual air pollution damage to $90 per family by 1976. A water clean-up program would reduce annual water pollution damage to $21 per family by 1980. The annual cost of the air clean-up program would be $65 per family and the water clean-up program would be $105 per family. Compute the following:

(Continued)

Outside or Community:

A. How would you classify your community's air and water?

B. Student Projects:
   1. List the industries located in your community. Check those that you feel have taken steps to preserve clean air? What steps could be taken by the others to help clean up the air?
   2. How is the waste being cared for? Is it being discharged into the local waters? Is it being burned, thus polluting the air?
   3. What could you suggest to your local authorities to improve conditions in your community?

C. Visit your local sewage system and ask them to explain its waste disposal operation to you.

D. Library research.

SUGGESTED RESOURCES

Publications:

Hidden Savings From Cleaner America, Audobon, March, 1972, National Wildlife Federation.
110 Co, SCIS, Population, I-C-E RMC.
190 Ki 1-4, Kimball, Richard, Poster Series, I-C-E RMC.

Audio-Visual:

Poisoned Air, 50 minutes, Carousel Film,s Inc., 1501 Broadway, N.Y., N.Y. 10035.
#0678 Air Pollution, color, 11 minutes, 1968, BAVI.
Family Planning, #230, I-C-E RMC.
#240 Using Community Resources, I-C-E RMC.

Community:

Sanitation Engineer
Director of Public Works

CONTINUED OR ADDED LEARNING ACTIVITIES

SKILLS USED: (Continued)

3. Percent
4. Average and comparing numbers

CLASSROOM: (Continued)

A. 1. What is the water and air pollution damage per family in 1972?
2. What would be the savings in annual air pollution damage per family by 1976?
3. What would be the net annual savings in air pollution by 1976?
4. What would be the net annual savings in air pollution by 1980?
5. What would be the net annual savings in water pollution by 1980?
6. What would be the annual cost of cleaning up the air and water?
7. How much would the amount of air and water pollution damage per family (per year) be reduced by 1980?
8. What would be the annual (air and water) pollution damage savings per family by 1980?
9. How much would be invested by the average family in an air and water clean-up program between now and 1975? (3 years)
10. The National Wildlife Federation estimates, however, that the amount computed in problem 9 would be recovered between 1975 and 1979. (4 years) How much money would be recovered per year between 1975 and 1979?
11. By what percentage is it estimated that the cost of air pollution damage can be reduced by 1976? Water pollution damage?

B. The Council on Environmental Quality reports that polluted air causes damage to human health that costs $6 billion yearly, damage to materials and vegetation is $4.9 billion yearly, lowering of property values is $5.2 billion yearly. What is the total cost?

C. In a study of two communities, one with clean air and one with polluted air, the cost of maintaining the family home and personal cleanliness was $84. more per year in the dirty air community. What would be the extra yearly cost in a dirty community for the families in your class?

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 9 - Management **SUBJECT** Mathematics

ORIENTATION Soil Erosion **TOPIC/UNIT** Percent

BEHAVIORAL OBJECTIVES

Cognitive:

Identify the advantages of strip-cropping and re-forestation of hillsides through experimentation.

Affective:

Locate, by observation, areas in his community where soil conservation should be practiced.

Skills Used:

1. Measurement (English and metric should be used)
2. Percent

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Experiment:
   1. Prepare an ordinary cookie sheet, one of cultivated soil and one of sod (each 7" high).
   2. Weigh them. Then measure various amounts of water in jars to represent a hard rain and an easy rain. Pour over each.
   3. Catch the runoff.
   4. Figure the percent of soil in each catch basin and the amount of water lost. Weigh pans again.

B. The average depth of topsoil is 7". An acre of topsoil of this depth weighs about 1,000 tons. Using the information provided in Table I on the reverse side, what percent of the soil was washed away where there were no trees?

C. A field loses .5 ton of topsoil planted to grass and 10 tons of soil planted to corn. The loss in corn is how many times as much as planted to grass?

(Continued)

Outside or Community:

A. Invite a farmer in to explain how he is conserving soil and thus preventing pollution of streams.

B. Take a field trip to study reforestation and strip-cropping.

C. Locate and map areas where erosion needs to be stopped in your community.

D. Visit by local County Soil Conservation Agent.
   Questions:
   1. What types of soil are in the region and how many acres of each exist?
   2. What types of programs are available to the farmer and industrialist in the county?
   3. How is soil tested?
   4. What is erosion and how can it be prevented?

E. Science Teacher (Physical Science, Geology, etc.) A team-teaching unit or as a guest speaker.

SUGGESTED RESOURCES

Publications:

Water Use: Principles and Guidelines for Planning and Management in Wis., Soil Conservation Society of America, 1969, I-C-E RMC #140-SO.
SCSA Conservogram, Soil Conservation Society of America, Winter 1970, I-C-E RMC, #VF.
Soil Conservation, "Conservation Facts for Programs, Projects, Teaching, Information" 1971, I-C-E RMC #VF.
U.S. Dept. of Agriculture, Soil Conservation Service, Agriculture Bulletin 347, (Continued)

Audio-Visual:

Film #7085, Soil Makers, $6.50, 1966, BAVI.
Film #0467, Conservation of Natural Resources, $2.00, 1937, BAVI.
Film #5079, Conserving Soil Today, $2.25, 1960, BAVI.
Garbage, #260, I-C-E RMC.

Community:

County Agricultural Agent
Farmer
County Soil Agent

CONTINUED OR ADDED LEARNING ACTIVITIES

CLASSROOM: (Continued)

D. Land available per person in the following countries is:

Italy	0.7 acres
England	0.3 acres
Sweden	1.5 acres
France	1.2 acres
Belgium	0.3 acres
United States	2.5 acres

Each amount is what percent of the land available in the U.S.?

E. Explain why many people suffer from malnutrition in European and Asian lands?

TABLE I
27 inch rainfall

	Forested Land	Eroded Land
Water Runoff	1/2%	62%
Erosion	None	34 tons of topsoil per acre

PUBLICATIONS: (Continued)

"Controlling Erosion on Construction Sites," December, 1970.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental: **Integrated with:**

CONCEPT NO. 10 - Economic Planning **SUBJECT** Mathematics

ORIENTATION Land Use and Recreation **TOPIC/UNIT** Area, Volume, Ratio and Proportion

BEHAVIORAL OBJECTIVES

Cognitive:

Compute the amount and percent of land (at school and home) covered by concrete, asphalt or gravel as a result of measurement.

Affective:

Demonstrate awareness of the amount of land required to support modern man in contrast to the amount available for recreational needs by citing examples. Promote the idea that land must be retained for recreational and wildlife use, even though some industries will not come in or expand.

Skills Used:

1. Area formulas
2. Percent
3. Averaging
4. Map reading

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

I.

A. How much concrete, asphalt or gravel covers the lot where you live? (buildings, patio, driveway, etc.)
   1. Compute the area in square feet. (sq. m)
   2. Compute the percent of area covered by concrete, asphalt, gravel for each of the class member's individual lots.
   3. Determine the average for your class.

B. Based on the class average, what would be your prediction for the community?

Outside or Community:

II.

A. Use the city maps and the City Engineer (if available)
   1. to show the percent of concrete, asphalt or gravel cover for the community (or neighborhood).
   2. Compare the amounts of industrial cover to recreational cover (sites).
   3. Compare the amounts of residential cover to industrial cover.
   4. Compare the amount of residential sites to recreational sites.

B. Using the figure from Part A, is your community providing enough recreational space for its residents? (General information about the amount of adequate space may be obtained from the city Recreation Department.)

C. Was the prediction of Part A conclusive with Part B?

SUGGESTED RESOURCES

Publications:

Pollution: Problems, Projects and Mathematics Exercises, #1082, Wisconsin Department of Public Instruction, Madison, Wisconsin.
"Land: Making Room for Tomorrow," from Saturday Review, March 6, 1971, I-C-E RMC, #VF.
Halsey, Clifton, "Selecting Suitable Uses for Land (Step 1)" Univ. of Minnesota Agricultural Extension Service, Oct. 1972, I-C-E RMC, #VF.

(Continued)

Audio-Visual:

#3849 Expanding City, 15 minutes, University of Wisconsin, 1956 BAVI.
#6429 Bulldozed America, 25 minutes, Carousel, 1965 BAVI.
#250 Men at Bay, I-C-E RMC.
Junkdump, #310, I-C-E RMC.
A Place to Play, #540, I-C-E RMC.

Community:

City Engineer
City Recreation Department
City Clerk (to obtain accurate maps of city)

CONTINUED OR ADDED LEARNING ACTIVITIES

PUBLICATIONS: (Continued)

"Parks and Open Space Politics System Planning Program" Metropolitan Development Guide, June 25, 1970.

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 11 - Individual Acts

SUBJECT Mathematics

ORIENTATION Pollution

TOPIC/UNIT Statistics

BEHAVIORAL OBJECTIVES

Cognitive:

Interpret data gotten through a questionnaire and survey to assess how "man" pollutes.

Affective:

Accept the need for anti-pollution programs on the basis of statistics. Promote and participate in anti-pollution programs in the community.

Skills Used:

1. Predicting
2. Taking information
3. Supplying data
4. Graphing

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. Students should discuss whether they are polluters and then fill out the attached questionnaire, "Am I A Polluter?"

B. Tabulate the results of the questionnaire and discuss what they as individuals and as a class can do to prevent pollution.

C. Simulation Game:
Garbage Game.
The purpose is to make the student aware of household waste and the means to deminish it. A Household Ecology Checklist is included.

Outside or Community:

A. Community (neighborhood) survey on "Am I A Polluter?" Make people more aware of their own over-use of appliances, etc.

B. School Project:
1. Analyze the amount of waste found on playground, halls, etc. How can this be corrected? Student Council may want to have an Anti-Pollution Day or Week and tabulate the results - a before - and after program.
2. Chart and publish results in school newspaper, etc.

SUGGESTED RESOURCES	CONTINUED OR ADDED LEARNING ACTIVITIES

Publications:

Questionnaire - attached to lesson, "Am I A Polluter?"
Keep America Beautiful, Inc.
"71 things you can do to stop pollution." I-C-E RMC #VF.
or write to:
Keep America Beautiful, Inc.
99 Park Avenue
New York, New York 10016.

Audio-Visual:

Junkdump, I-C-E RMC.
Later Perhaps, #290 I-C-E RMC.

Community:

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AM I A POLLUTER?

QUESTIONNAIRE

Many of us have become increasingly aware of the problems of pollution, but have we stopped to think about the extent to which each of us contributes to the destruction of our environment? This questionnaire is designed to help us determine how much we pollute. After we fill this in, perhaps we will be in a better position to stop pollution.

Answer the following questions by circling either yes or no.

Yes No 1. I always throw paper away in trash barrels, pick up my camp site and picnic grounds.

Yes No 2. I ask my parents to buy returnable bottles and soaps low in phosphate.

Yes No 3. I own nothing which requires the use of electricty.

Yes No 4. I walk or bike to school and other places as much as possible.

Yes No 5. I buy goods in returnable containers and in cardboard boxes rather than in plastic containers when I have the choice.

Yes No 6. I turn the lights off when I am not using them.

Yes No 7. I have bothered to learn about the problems of pollution and will try to help solve them in my community and in my country.

CHECK THE FOLLOWING IF IT APPLIES TO YOUR FAMILY:

In order to cut down on air pollution and avoid draining the world of non-renewable resources such as coal, we will have to change some of our habits. Before we can do this we need to know to what extent we actually demand the use of gas and electricity. Some of these are essentials, some aren't. Check all the ones your family has; then begin to consider what you can give up.

_____vacuum cleaner	_____electric heater	_____electric can opener
_____hair dryer	_____electric typewriter (why not a portable)	_____ dishwasher
_____electric toothbrush (is this really necessary)	_____dehumidifier	_____stove
_____washing machine	_____toaster	_____refrigerator
_____dryer	_____electric fry pan (what's wrong with the others)	_____alarm clock (electric)
_____fan	_____blender	_____electric razor (hand razors give closer shave)

(Continued)

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AM I A POLLUTER?

QUESTIONNAIRE
(Continued)

_____air conditioner (how many days is it unbearably hot)

_____garbage disposal

_____tape recorder (non-portable)

_____television

_____electric knife (really?)

_____record player (non-portable)

_____radio (non-portable)

IN ORDER TO FURTHER CUT DOWN ON AIR AND OTHER POLLUTION, MY FAMILY:

Yes No 1. Rides bikes or walks instead of riding in cars.

Yes No 2. Has only one car.

Yes No 3. Has no snowmobiles.

Yes No 4. Has no motor boats.

Yes No 5. Never burns leaves or garbage.

Yes No 6. Recycles newspapers rather than throwing them out.

Yes No 7. Uses Trend or Fab soap which are low in phosphates.

Now that you have filled this out, rate yourself; I am

_____ CLEAN (a non-polluter). If you and your family answered all the questions with a yes and checked only 4 of the appliances.

_____ GRAY (a partial polluter) If you and your family answered 7 or more questions yes and checked no more than 10 appliances.

_____ DIRTY (a polluter) If you and your family answered 8 or more questions no and checked over 10 appliances.

THINK ABOUT IT AND HELP SAVE OUR ENVIRONMENT

E. S. E. A. Title III – PROJECT I-C-E 59-70-0135-4

Environmental:

Integrated with:

CONCEPT NO. 11 - Individual Acts

SUBJECT Mathematics

ORIENTATION Forest Resource

TOPIC/UNIT Percent and Graphing

BEHAVIORAL OBJECTIVES

Cognitive:

Determine what groups of people cause the most forest fires by using percent data supplied.

Affective:

Demonstrate awareness of the causes of forest fires and how much forest land is destroyed by forest fires by making his calculations and reporting the results. Plan a campaign that could be used to reduce the preventable forest fires in his state or county.

Skills Used:

1. Statistics
2. Interpreting data
3. Circle graphing
4. Comparing numbers

STUDENT-CENTERED LEARNING ACTIVITIES

In-Class:

A. For data to answer the following questions, see Table I on the reverse side.
1. What single group was most responsible for forest fires?
2. What single factor was least responsible for forest fires?
3. In which of the classes of people did the number of fires decrease from 1967 to 1968?
4. Compare the fires caused by the hunter in 1967 to 1968.
   a. Was it an increase or a decrease?
   b. The decrease is what percent of the original number?
5. The fires caused by the local resident is how many times greater than the fires caused by transients (to the nearest tenth)?
6. Construct a circle graph of the 1968 data showing those people responsible for fires. Also include the non-man-made forest fires.

(Continued)

Outside or Community:

A. Ask a Forest Ranger to speak to the class.
Questions:
1. The number of fires in the local territory is_____?
2. The main cause of fires in their area is_____?
3. The acreage lost due to fires is_____?
4. The methods used in fire fighting_____?

B. County Soil Conservationist or Agricultural Agent.
Questions:
1. How many acres of forest land are in the county?
2. Is there a problem with forest fires (man-made or non-man-made) in the county?
3. What is the general procedure for reporting a fire or any damage done to a forest?

SUGGESTED RESOURCES

Publications:

1967-69 Biennial Report, Department of Natural Resources, State of Wis.
U.S. Dept. of Education, Conservation, Education Material, Grades 5-9 I-C-E RMC.
American Forestry Assoc.
919 17th Street, N.W.
Washington, D.C. 20006.
U.S.D.A. - Forest Service
633 W. Wisconsin Avenue
Milwaukee, Wisconsin

Audio-Visual:

Forest Conservation, 11 minutes, color, Encyclopedia Britannica Educational Corp.
425 North Michigan Avenue
Chicago, Illinois 60611
Wasted Woods, Association Films,
600 Grand Avenue,
Ridgefield, New Jersey 07657.
Men at Bay, #250 I-C-E RMC.
FS St 23, Trees for 2001, I-C-E RMC.

Community:

Forest Ranger
Conservation Department
County Forester

CONTINUED OR ADDED LEARNING ACTIVITIES

CLASSROOM: (Continued)

TABLE I

NUMBER OF FIRES BY CLASS OF PEOPLE RESPONSIBLE

Class of People	1967		1968	
	No.	%	No.	%
Local Resident	889	41.2	1,199	50.7
Transient	159	7.4	185	7.8
Berrypicker, etc.	8	0.4	2	0.1
Fisherman	22	1.0	24	1.0
Hunter	71	3.3	42	1.8
Work crew, etc.	44	2.0	49	2.1
Internal Combustion Engine	876	40.6	759	32.1
Miscellaneous	55	2.6	84	3.6
Non-Man-caused lightning	32	1.5	19	0.8

E. S. E. A. Title III – PROJECT I–C–E 59–70–0135–4

Environmental:

Integrated with:

CONCEPT NO. 12 - Stewardship

SUBJECT Mathematics

ORIENTATION Forest Resource

TOPIC/UNIT Problem Solving and Estimating

BEHAVIORAL OBJECTIVES

Cognitive:

Solve the problems concerning forestry operations and the preservation of our trees using mathematic principles of addition, subtraction, division, multiplication, proportion and percent. Apply principles of estimating to problem about forestry operations and preservation of our trees.

Affective:

Demonstrate appreciation of the beauty and value of a living tree by determining the value of a property without and with trees.

Skills Used:

1. Rounding off numbers
2. Estimation
3. Basic computation
4. Percent

STUDENT–CENTERED LEARNING ACTIVITIES

In-Class:

A. In the following problems, first round off and estimate the answer; then find the exact answer.
1. A forest fire that was discovered at 3:55 p.m. on Tuesday was brought under control at 4:30 a.m. on Thursday. How many hours was the fire out of control?
2. In a recent year, 7,283 forest fires west of the Rockies caused losses averaging $1,435 per fire. What was the total loss?
3. In the U.S. there are 151 national forests totaling 181,255,449 acres. Find the average number of acres per national forest.
4. Mr. Hill hired boys to set out seedlings on 37 acres of worn-out pasture land. He needed 1050 seedlings per acre. How many did he need in all?
5. Mr. Hill owned 200 acres of timberland. He was offered $2,850 for all the trees on it. Instead, he thinned his woods with a forester's help.

(Continued)

Outside or Community:

A. Visit a tree farm or local Nursery.
1. Observe the method of tree planting used and the types of trees planted.
2. Determine how long it takes for a tree to reach maturity.
3. What care is required to have a successful tree farm?
4. What are the cost factors in operating a tree farm?

B. Have a forester speak to the class on forestry practices.
1. What are the types of lumber obtained from trees?
2. How is a forest managed?
3. How is a forest thinned and when is it necessary to thin a forest?

SUGGESTED RESOURCES

Publications:

U.S. Forest Products Lab
Madison, Wisconsin.
U.S. Forest Service
Conservation Education Materials
Grades 5-9,
U.S. Dept. of Agriculture.

Audio-Visual:

Film #5251 - Biology: Tropical Rain Forest, $7.25, BAVI 1961.
Film #5250 - Temperate Deciduous Forest, $7.25, BAVI 1962.
Film #4804 - Biology: Coniferous Forest Biome, $6.75, BAVI 1969.
Film #3313 - Life in the Forest, North America, $3.50, BAVI 1955.

Community:

U.S. FORESTER

CONTINUED OR ADDED LEARNING ACTIVITIES

CLASSROOM: (Continued)

A. 5. He sold $5,925 worth of trees for lumber and $4,212 worth for firewood. How much more did he make by thinning his woods. Why was thinning also an advantage for his land?

6. A man bought 42 acres of worn-out farm land for $15 an acre. By using wise conservation practices, he improved the land so much, that in 10 years, it was valued at $5,450. How much had the land increased in value in the 10 years? What percent had he gained on his investment?